**STAR 2006: NOAA Ship *David Starr Jordan***
**Weekly Science Report**

*Robert L. Pitman, Cruise Leader*
*21 September 2006*

**Science Summary: 14 - 20 September 2006**

Soggy - we spent most of the week in a wet area, but by Tuesday we seemed to have passed to the north of the ITCZ rain belt where we hope to spend most of the rest of the cruise. Several days last week the observers spent more time covering and uncovering the binoculars than actually looking through them.

On 16 Sept, our shore party (Lopez-Victoria, Vilchis and Pitman) came back aboard after spending 5 days on Malpelo Island. Malpelo is a city block or two of barren rock, jutting up 900 feet from the sea surface. We went to study the nesting Nazca Boobies (*Sula granti*; my spellchecker suggests NASCAR Booby - egads). From aerial photographs we took of the island in the 1980s, we previously estimated a population of 24,000 boobies, but is was clear from this trip that many more move onto the island in the evening than we had suspected and the population could be 2-3 times our estimate; this would make it by far the largest Nazca Booby colony in the world. Our specific mission was to investigate the diet of Nazca Booby; we collected 90 regurgitation samples and found that it feeds mainly on flyingfish. This means that if 50,000 Malpelo boobies eat just 4 average-sized flyingfish/day (they often eat 2-3 times that many), then 30 metric tons of flyingfish are rerouted onto the island every night to support the local economy. That local economy consists mainly of three species of endemic lizards (found no place else in the world) and a truly remarkable number of endemic land crabs. It warms the cockles of a dipnetter's heart to think of an entire island ecosystem powered by flyingfish.

Get a grip: Late in the week we moved north, to just off Costa Rica where the coast is rich with sea turtles. We were working on a large female olive ridley that we brought aboard, when her hind flipper inadvertently slapped against my palm – a herpetological high-five. On contact though, her large claw curved around behind my thumb, and the bones of her flipper wrapped around the heel of my hand as if we were preparing to arm wrestle. Her flipper was a supple leather mitten and sheathed inside I could clearly see long, delicate finger bones and flexed knuckles; here was a kindred soul, reaching across millions of years with a hand as clearly recognizable as my own. If you don't believe in the explanatory power of evolution you should hold hands with a turtle sometime. Just about everyone, including all of the scientists and the entire deck force has been helping out catching and collecting from the turtles – we couldn't get it done without them and we appreciate everyone's help.

Everything is going well here: the Jordan is currently experiencing no mechanical problems(!), we are blessed with a cheerful and very competent crew, the scientific party is operating like a well-oiled (if well-watered) machine, and we're ready for more. Bring it on.

**Sightings and Effort Summary for Marine Mammals**

| Date | Start/ Stop Time | Position | Total nm | Average Beaufort |
|---|---|---|---|---|
| 091406 | 0618 | N07:23.71 W078:07.23 | 79.0 | 2.8 |
| | 1749 | N05:54.41 W078:20.13 | | |
| 091506 | 1127 | N05:47.82 W079:56.02 | 20.2 | 2.3 |
| | 1743 | N05:18.21 W080:15.97 | | |
| 091606 | 0614 | N04:26.81 W081:09.89 | 36.7 | 3.7 |
| | 1816 | N03:44.35 W081:40.37 | | |
| 091706 | 0628 | N03:37.26 W082:49.61 | 77.3 | 4.9 |
| | 1825 | N04:38.13 W084:07.12 | | |
| 091806 | 0632 | N05:54.89 W084:31.23 | 59.1 | 3.2 |
| | 1821 | N07:16.63 W084:55.61 | | |
| 091906 | 0641 | N08:33.60 W085:31.74 | 68.9 | 2.3 |
| | 1816 | N10:02.01 W085:55.61 | | |
| 092006 | 0647 | N11:05.15 W086:00.11 | 62.2 | 2.8 |
| | 1825 | N10:28.63 W087:31.86 | | |

| Code | Species | Number of Sightings |
|---|---|---|
| 002 | *Stenella attenuata* (offshore) | 1 |
| 006 | *Stenella attenuata graffmani* | 6 |
| 013 | *Stenella coeruleoalba* | 5 |
| 015 | *Steno bredanensis* | 4 |
| 017 | *Delphinus delphis* | 5 |
| 018 | *Tursiops truncatus* | 13 |
| 021 | *Grampus griseus* | 4 |
| 031 | *Peponocephala electra* | 1 |
| 036 | *Globicephala macrorhynchus* | 8 |
| 048 | *Kogia sima* | 2 |
| 051 | *Mesoplodon* sp. | 2 |
| 061 | *Ziphius cavirostris* | 1 |
| 080 | *Kogia* sp. | 1 |
| 078 | unid. small whale | 1 |
| 079 | unid. large whale | 1 |
| 077 | unid. dolphin | 2 |
| **Total** | | 56 |

**Photography (Cornelia Oedekoven and Laura Morse)**

This week we were able to get what will likely be the best photos of striped dolphins for the entire trip. A small school of them came to ride the bow presenting nice lateral views. Otherwise, the usual suspects were photographed: bottle-nosed dolphins, common dolphins and coastal spotters dominated the scene.

| Species Code | Common Name | Weekly Photographs | | Total Photographs | |
|---|---|---|---|---|---|
| | | Individuals | Schools | Individuals | Schools |
| 002 | Spotted dolphin (offshore) | | | | 10 |
| 003 | Spinner dolphin (unid) | | | | |
| 006 | Spotted dolphin (coastal) | | 4 | | 9 |
| 010 | Spinner dolphin (eastern) | | | | 4 |
| 013 | Striped dolphin | | 2 | | 9 |
| 015 | Rough-toothed dolphin | | | | 6 |
| 017 | Short-beaked common dolphin | | 5 | | 18 |
| 018 | Bottlenose dolphin | | 6 | | 23 |
| 021 | Risso's dolphin | | | | 12 |
| 032 | Pygmy killer whale | | | | 6 |
| 036 | Short-finned pilot whale | | 2 | | 5 |
| 037 | Killer whale | | | | 3 |
| 046 | Sperm whale | | | | 1 |
| 049 | Unidentified beaked whale | | | 20 | |
| 063 | Baird's beaked whale | | | 1 | |
| 072 | Bryde's whale | | | 1 | |
| 074 | Fin whale | | | 5 | |
| 075 | Blue whale | | | 2 | |
| 076 | Humpback whale | | | 15 | |
| 090 | Spotted dolphin (unidentified) | | | | |
| 099 | Sei/Bryde's whale | | | | |
| **Total** | | 0 | 19 | 44 | 106 |

**Biopsy (Juan Carlos Salinas and Ernesto Vásquez)**

| Species | Common Name | Weekly | | Total | |
|---|---|---|---|---|---|
| | | Samples | Takes | Samples | Takes |
| *Stenella attenuata* | Pantropical spotted dolphin | 0 | 0 | 12 | 23 |
| *S. attenuata graffmani* | Coastal spotted dolphin | 14 | 20 | 18 | 28 |
| *Stenella longirostris orientalis* | Eastern spinner dolphin | 0 | 0 | 6 | 20 |
| *Stenella longirostris subsp.* | unidentified spinner | 0 | 0 | 21 | 33 |
| *Stenella coeruleoalba* | Striped dolphin | 1 | 5 | 2 | 8 |
| *Delphinus delphis* | Short-beaked common | 0 | 0 | 15 | 32 |
| *Steno bredanensis* | Rough-toothed dolphin | 0 | 0 | 3 | 3 |
| *Tursiops truncatus* | Bottlenose dolphin | 8 | 13 | 37 | 61 |
| *Globicephala macrorhynchus* | Short-finned pilot whale | 11 | 23 | 33 | 77 |
| *Physeter macrocephalus* | Sperm whale | 0 | 0 | 8 | 8 |
| *Megaptera novaenaqliae* | Humpback whale | 0 | 0 | 2 | 5 |
| *Balaenoptera edeni* | Byrde's whale | 0 | 0 | 3 | 3 |
| *Balaenoptera musculus* | Blue whale | 0 | 0 | 8 | 16 |
| **Total** | | 34 | 62 | 169 | 31 |

**Bird Buzz (Rich Pagen and Chris Cutler)**

Shorter days, yellowing leaves and crisper air way to our north are heralding the coming of winter in the Northern hemisphere. These cues send migrant land birds on their way south to warmer climes, and our position just west of Central America allows us to continue to serve as an oasis for lost avian travelers. Unfortunately, we are unable to offer them much more than a metal perch to rest upon. Of the 12 species of land birds attracted to our ship this week, two Yellow-green Vireos and a Wood-Pewee (Eastern or Western) have one of the more interesting stories to tell. Attempting to find the perfect perch, and perhaps to avoid the rain, our three heroes ended up getting a hair too close (translate: a feather too close) to the air intake for the ship's engine, got sucked in, and found themselves trapped in a tight (and extremely windy) space. Assistant engineer Stephen Roberts sawed through rusted bolts to remove two metal grates which allowed us to get in and free them. Our thanks to Steve, as well as Chief Engineer Howard Boswell, CO Keith Roberts, and Tim Gerrodette for their roles in setting this rescue mission in motion.

A second stop at Malpelo Island brought us back to the breeding domain of Nazca Boobies, Brown and Black Noddies, and White Terns. Evening net tows were once again graced by Swallow-tailed Gulls foraging in the waters illuminated by the ship's lights, appearing and disappearing like ghosts in and out of the darkness. Bird sighting rate on transect was generally low this week, made up for by occasional patches of trash and marine debris which kept us struggling to keep up. Besides the flotsam, Harcourt's and Galapagos Storm-Petrels were often our only companions. This changed drastically as we were crossing the shelf break off of Nicaragua, where feeding birds spilled from one flock into another (one flock was made up of over 1000 birds). Two species, Brown Booby and Pink-footed Shearwater, were the staple of these aggregations, with lesser numbers of Arctic and White Terns, Black Storm-Petrels, Audubon's and Wedge-tailed Shearwaters. Another striking characteristic of these flocks was the number of Parkinson's Petrels present. One flock contained 18 individuals, with an estimated total of 38 seen within a 3 hour period, between both flock counts and transect. A Parkinson's Petrel seen was seen two days earlier with a 1-meter long strand of thick monofilament fishing line, perhaps with a flesh-impaled hook on the other end, around one of its legs. This was a glaring reminder of the ongoing threats to seabirds, many of which are killed by interactions with fisheries and fishing gear.

**Turtle Operations (Lindsey Peavey, *et al.*)**

This was a truly awesome week for turtles. One of the highlights was capturing a juvenile (32.8 cm straight length) hawksbill sea turtle (*Eretmochelys imbricata)*. This species is highly endangered and usually found foraging on coral reefs, so it was a real treat to find one hiding in a large branched log floating offshore of Colombia. *E. imbricata* has a distinctive straight, narrow beak, and the upper mandible tapers to a point at the tip, giving the "hawksbill" its common name. However, it is its beautiful calico swirled carapace that made it famous worldwide. The hawksbill shell is sought after to make 'tortoise shell' accessories and to decorate walls. The international trade of hawksbill turtle shell has been devastating to their populations. Now, most countries protect the endangered species by law, but there is a substantial black market for the precious piece of nature's art. The DSJ paparazzi showered our bashful friend with photos, look for some on the website!

Our four consecutive slow turtle weeks came to an anticipated end when we neared the Costa Rican coast. Not by coincidence, the turtles thicken as we sailed close to the Nicoya Peninsula and just off Playa Ostional, where the olive ridley 'arribada' happens this time of year. This, and the clear skies and calmer seas, gave us an opportunity to process many healthy, mature adults, female and male, migrating toward nesting beaches. We saw olive ridleys on both sides of the continental shelf border, and observed feeding activities when the bottom started to drop off. We put out three remote sensing tags this week, including

two PAT tags that will record dive time and depth data, and one satellite transmitter (SDR). The SDR was laminated snuggly on a large (66.3 cm straight line) adult male affectionately named "Ernesto." The tag is designed to have a battery life of at least one year and will hopefully give us location information for many months; fingers crossed that our reptilian friend leads a long, healthy life. Check back for updates as we follow Ernesto's journey through the ETP.

| **Species** | **Common name** | **Number sampled** | |
|---|---|---|---|
| | | **Weekly** | **Total** |
| *Caretta caretta* | Loggerhead | 0 | 8 |
| *Eretmochelys imbricata* | Hawksbill | 1 | 1 |
| *Lepidochelys olivacea* | Olive ridley | 27 | 73 |
| **Total** | | 28 | 82 |

**Acoustics (Laura Morse)**

The sonobuoys sadly remained dormant this week with nary a large whale to toss them at. However, dolphins have been ever present and the bow hydrophone has been frequently in use. This week we recorded short-beaked common dolphins, bottlenose, coastal spotted and most excitedly, striped dolphins. Striped dolphins are typically non-bow riders, but the school we recorded bucked the trend and came over to enjoy what must be a dolphin's form of an amusement ride.

**Fish Sampled for Diet and Isotope Analysis**

| Species | Samples | |
|---|---|---|
| | Weekly | Total |
| Yellowfin tuna | 4 | 22 |
| Skipjack* | 2 | 11 |
| Wahoo | 0 | 3 |
| Mahi mahi | 0 | 11 |

*includes black skipjack

**Oceanographic Operations (Candy Hall)**

A major contribution to Pacific rainfall comes from atmospheric moisture imported from the north Atlantic Trade Winds. The land barrier of Central America, while receiving plenty of rain and nurturing luxurious rainforest, is not broad enough to catch all the moisture collected by the northern hemisphere Trades. This phenomenon allows the Pacific Ocean to experience a freshwater gain, visible in the low salinity values that are characteristic of waters adjacent to the Gulf of Panama. These waters originate in the west and are transported eastwards across the Pacific Ocean by the North Equatorial Countercurrent (NECC). The NECC's path channels these waters through the heavy rains of the Intertropical Convergence Zone, ensuring that they arrive in the east with substantially reduced salinities. The weak currents of the Gulf of Panama, in which our week started, subsequently expose the surface waters to additional heavy rains produced by the import of Atlantic moisture, further reducing the salinity. This phenomenon was beautifully represented by salinity recordings of 26.52 psu (practical salinity units) to 30.91 psu in the Gulf of Panama, so far our lowest sea surface salinity values for this cruise!

| Date | CTD | XBT | Bongo tow | Manta tow |
|---|---|---|---|---|
| 14 Sept | 2 | 2 | 1 | 1 |
| 15 Sept | 2 | 3 | 1 | 1 |
| 16 Sept | 2 | 1 | 1 | 1 |
| 17 Sept | 2 | 3 | 1 | 1 |
| 18 Sept | 2 | 3 | 1 | 1 |
| 19 Sept | 2 | 4 | 1 | 1 |
| 20 Sept | 1 | 4 | 1 | 1 |
| **Total** | 13 | 21 | 7 | 7 |